

REMARKS

The present amendment is prepared in accordance with the new revised requirements of 37 C.F.R. § 1.121. A complete listing of all the claims in the application is shown above showing the status of each claim. For current amendments, inserted material is underlined and deleted material has a line therethrough.

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Applicants note that the restriction requirement has been made final and that claims 11-25 have been withdrawn from consideration. Claims 1-10 are pending in the application and all ten (10) claims have been treated on the merits. Claims 8-9 have been canceled and new claim 26 added. Accordingly, claims 1-7, 10 and 26 are pending in the application.

Claims 1-6 have been rejected under 35 USC 102(b) as being anticipated by U.S. Patent No. 4,178,188 to Dussault et al. Dussault et al. is cited as disclosing an apparatus for removing contaminants from a semiconductor wafer by applying a film of liquid solvent to an exposed wafer surface while the wafer is in rotation (centrifugal) and ultrasonic energy is applied to the liquid film (and directly to the wafer) and removing the liquid solvent with entrained contaminants from the wafer.

Before we review the rejections in detail, it may be helpful to set forth Applicants' invention as now claimed. Claim 1 has been amended to indicate that the

particulate matter containing fluidized sacrificial material coating is formed into a strippable film and then the strippable film is removed providing a substrate surface having less particulate matter thereon. Basis for the amendments may be found throughout the specification, for example on page 7, the paragraph beginning at line 4.

In this paragraph it is noted that the fluid or fluidized sacrificial coated material containing the suspended particulate matter is then preferably formed into a strippable film which is removed from the substrate surface providing a cleaner substrate surface having fewer contaminating particles thereon. The film is a strippable film which partially or fully encapsulates the particle. Claim 26 has been added to indicate that the fluid coating may be formed into a film simultaneously with application of energy to dislodge the particles.

Figs. 1A-1F show the claimed method wherein, for example, a liquid viscous polymeric material 13 is applied to the wafer surface. In Fig. 1B an energy source 14 is shown directed at the surface of the liquid polymeric material 13 and in Fig. 1C the effect of the energy source 14 on the substrate is shown wherein the particles 12 have been dislodged from the surface of substrate 11 and are now suspended (encapsulated) in the fluid polymeric material coating layer 13. In Fig. 1D, the polymeric material coating layer 13 is formed into a cured strippable film shown as 13b. Fig. 1E shows removal of the cured strippable film 13b by a pulling action shown by arrow A removing the cured polymeric material strippable film 13b from the surface of substrate 11. Fig. 1F shows a clean substrate 11 surface wherein the contaminating

particles 12 of Fig. 1A have been removed using the method and apparatus of the invention.

It is clear that Dussault et al. do not show Applicants' invention as now claimed. Dussault et al. shows a film of liquid solvent continuously flowing across the exposed workpiece surface while the workpiece is in rotation and ultrasonic energy is applied to the liquid film causing cavitation in the solvent thereby affecting cleaning of the workpiece surface. A strippable film is not formed and the workpiece is cleaned by merely spinning the workpiece at high speed to remove the continuously flowing liquid solvent containing the particles from the surface of the substrate.

Claims 1-3, 6 and 10 have been rejected under 35 USC 102(b) as being anticipated by U.S. Patent No. 5,690,749 to Lee. Lee is cited as disclosing a method for removing contaminate particulate matter (24) from a contaminate particle containing substrate surface (12) comprising a number of steps. A sacrificial coating of a material (16) is applied to a substrate surface (12) containing undesirable particulate matter thereon (24) which material is to encapsulate and suspend the undesirable particles therein. Energy is applied, citing col. 4, lines 25 et. seq. to the coated substrate to dislodge at least of the particulate matter from the surface of the substrate into the sacrificial coating such that the particulate matter is partially or fully encapsulated and suspended within the sacrificial coating. The particulate matter containing sacrificial material coating is then removed providing a substrate surface having less particulate matter thereon. As to dependent claims 2, 3, 6 and 10, the reference is cited as disposing a semiconductor wafer and that the sacrificial coating material is a fluid or

liquid. The Examiner considers that fluid encompasses a liquid and a liquid is construed broadly as being neither solid nor gaseous.

The Lee patent shows the removal of particles on a substrate surface using a tape 14 having an adhesive layer 16. The adhesive layer of the tape is applied to the surface of the substrate 12 and comes in contact with particles 21-24 on the substrate surface. The tape is then removed from the surface and the adhesion layer is able to remove the particles from the surface of the substrate.

Referring to the figures of Lee, it is clear that the contaminating particles are only removed at the surface of the adhesive layer. They are not dislodged from the substrate surface and partially or fully encapsulated or suspended within the adhesive layer.

With regard to the Examiner's assertion that energy is applied as in Applicants' invention, this is respectfully submitted technically inaccurate. The energy supplied is to conform the surface of the tape on the surface of the substrate to which the tape is being adhered. There is no energy used which dislodges the particles from the surface of the substrate to be cleaned and which energy moves the particles into the sacrificial coating as in Applicants' invention.

With regard to the Examiner's assertion that the adhesive layer of Lee is a liquid since it is neither solid nor gaseous, it is likewise respectfully submitted that even if it is considered being a liquid, it is not later formed into a strippable film as now set forth in Applicants' claims. In fact, the adhesive layer of Lee is a strippable film by definition since it is an adhesive tape. Accordingly, there is no change in the adhesive

layer as in Applicants' layer wherein a fluid layer is formed into a strippable film containing encapsulated or suspended particulate matter therein. Further, Applicants' coating is a fluid (fluidized) and it is respectfully submitted that the adhesive layer 16 of an adhesive tape is not a fluid as defined by Applicants.

Claims 7, 8, and 9 have been rejected under 35 USC 103(a) as being unpatentable over Lee and U.S. Patent No. 5,120,369 to Malotky. The Examiner acknowledges that Lee fails to explicitly disclose that the sacrificial coating material is a curable polymer formed into a film. Malotky is cited to explicitly disclose the missing element since Malotky discloses a method wherein a tailor-made polymer film is applied to a surface for the purpose of immobilizing contaminating particles. The polymer is disclosed to take up the undesirable material by solution, absorption, adsorption and hold such undesirable materials in solid suspension with subsequent stripping of the polymeric material. The Examiner cites the abstract and col. 2, lines 65 et seq., and col. 4, lines 60 et seq. As to claim 9, the Examiner asserts that when the polymer is sprayed onto the inclined surface it will inherently flow and, to the extent contaminants are present will pick them up and that the artisan would have been motivated to incline the surface to facilitate easier coating and easier access to the surface.

Claim 9 has been canceled.

Lee as discussed above does not disclose nor teach Applicants' invention since it relates to merely removing particles by attachment of the particles to the surface of an adhesive layer on a tape. Malotky does disclose the use of a polymer film system

but it is clear that it is not removing particles from a surface but is removing toxic or hazardous chemicals from the surface using a polymer that takes up the undesirable materials by solution, absorption and adsorption. Further, neither Lee nor Malotky teach an integral step of Applicants' invention to apply energy to the coated substrate to dislodge at least some of the particulate matter into the sacrificial coating. Lee as discussed above merely uses the adhesive properties of the tape to attach the particles to the surface of the tape. Malotky expressly teaches that unlike the prior art methods of removing toxic chemical agents from equipment surfaces, there is no need for the use of mechanical agitation or abrasion. See column 1, lines 67 et seq. Thus, no energy is used. The Malotky polymer is chosen to give the maximum solution or otherwise absorb and blot up and clean up chemical agents. It is necessary in Malotky to determine the relative solubility parameter of the chemical agent and the polymer. See column 2, the paragraph beginning at line 65.

It is respectfully submitted that it is clear that Lee in combination with Malotky does not disclose nor teach Applicants' invention. Applicants' invention requires applying a sacrificial coating of material to a substrate surface containing particulate matter thereon and fluidizing the material if necessary and then applying energy to the fluidized coated substrate to dislodge at least some of the particulate matter into the fluid sacrificial coating. The particulate matter containing sacrificial material coating is then formed into a strippable film and removed (stripped) providing a substrate surface having less particulate matter thereon. Neither Lee nor Malotky disclose such a method.

Claims 4 and 5 have been rejected under 35 USC 103(a) as being unpatentable over Lee and U.S. Publication No. 2002/0189635 to Bodet et al. The Examiner acknowledges that Lee apparently fails to explicitly disclose the use of sonic energy and vibrational energy and Bodet is cited to disclose a method for cleaning a substrate, including a first step of applying a solution onto the substrate and vibrating the solution/substrate. The ultrasonic energy facilitates release of the deposits from the surface. The Examiner concludes that the artisan would have been motivated to make the instant combination in an attempt to maximize the interfacial contact between contaminants and the cleaner/coating, and with higher viscosity coatings/solutions to ensure better conformal coating.

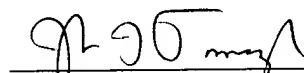
Lee as discussed above does not disclose nor teach Applicants' invention since it merely shows a tape wherein particles on the surface of a substrate adhere to the surface of the tape and are removed when the tape is removed. Bodet et al. shows a process of cleaning a substrate wherein a cleaning solution is applied to a substrate surface and then a hand held implement applies energy to the cleaning solution to clean the substrate surface. It is clear that there is no strippable film formed and the cleaning solution maintains its liquid form in the Bodet et al. process. Accordingly, it is respectfully submitted that claims 4 and 5 are properly allowable under 35 USC 103(a).

In summary, it is respectfully submitted that claims 1-7, 10 and new claim 26 are properly allowable over the references cited above. Applicants' invention is directed to a method for removing contaminant particulate matter from a substrate

surface by applying a sacrificial coating of material to the surface, which coating is a fluid or is fluidized, and then energized to dislodge at least some of the particulate matter from the surface of a substrate into the fluid sacrificial coating. The sacrificial coating is then formed into a strippable film and removed from the substrate surface providing a substrate surface having less particulate matter thereon. None of the references show such a method either singly or in any proper combination.

It is respectfully submitted that the application has now been brought into a condition where allowance of the case is proper. Reconsideration and issuance of a Notice of Allowance are respectfully solicited. Should the Examiner not find the claims to be allowable, Applicants' attorney respectfully requests that the Examiner call the undersigned to clarify any issue and/or to place the case in condition for allowance.

Respectfully submitted,

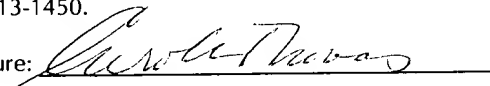


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